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EXAMINER	
RICHER, AARON M	

ART UNIT	PAPER NUMBER
2676	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/005,824	MOJAVER ET AL.	
	Examiner	Art Unit	
	Aaron M Richer	2676	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 December 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 April 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5,7* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Objections

1. Claim 17 is objected to because of the following informalities: Line 9 of claim 17 substitutes the word "imag" for "image". Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 8, 21, and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 8 recites the limitation "the imager" in line 1. There is insufficient antecedent basis for this limitation in the claim. It is suggested that claim 8 should be dependent on claim 7, which discloses "an imager", instead of on claim 6.

5. Claim 21 recites the limitation "the first display" in line 2. There is insufficient antecedent basis for this limitation in the claim. It is suggested that this limitation be amended to read "the display", since there is only one display being claimed in claim 21. Claim 22 is dependent on Claim 21 and therefore incorporates this limitation as well.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claim 17 is rejected under 35 U.S.C. 102(b) as being anticipated by Zimmerman (U.S. Patent RE36,207).

8. Claim 17 recites "A device for providing a perspective-corrected view of at least a portion of a wide angle image, comprising: an image-capturing device having a fish-eye lens for generating the wide angle image". Zimmerman discloses an invention that includes an "image capturing device" (col. 3, lines 60-64) with a "fisheye lens that provides an image of the environment with a 180 degree view" (col. 3, lines 29-36).

Claim 17 further recites "a processor in communication with the image-capturing device, the processor correcting at least a portion of the image for distortions introduced by the fish-eye lens by mapping a point (u,v) on an undistorted image plane corresponding to a perspective-corrected view of the image portion to a point (x,y) on a distorted image plane corresponding to the imag in accord with an angle for viewing a section of the hemisphere corresponding to the image portion from a vantage point offset from a center of the hemisphere and a distance between the vantage point and the center of the hemisphere."

Zimmerman discloses "An image processing system consisting of an X-MAP and Y-MAP processor" (col. 3, lines 29-36). Zimmerman also discloses a "display driver" among other components that "function as a system to select a portion of the input image (fisheye or wide angle) and then mathematically transform the image to provide the proper prospective for output" (col. 4, lines 6-16). Equations 17 and 18 in col. 7 of Zimmerman show a method of mapping an object point (u,v) that represents where the image is actually located to an image point (x,y). Zimmerman further discloses "image

transform processor means... for producing output transform calculation signals according to a combination of said digitized signals, said selected viewing angles and said selected magnification" (col. 8, lines 24-31).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-16 and 23, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmerman in view of Manelphe (U.S. Patent 5,077,609).

11. Claim 1 recites "A device for providing a perspective corrected view of at least a portion of a wide angle image, comprising: an image-capturing device having a fish-eye lens for generating the wide angle image". Zimmerman discloses a perspective-correcting invention that includes an "image capturing device" (col. 3, lines 60-64) with a "fisheye lens that provides an image of the environment with a 180 degree view" (col. 3, lines 29-36).

Claim 1 further recites "a processor coupled to the image capturing device that receives the image". Zimmerman discloses "An image processing system consisting of an X-MAP and Y-MAP processor" (col. 3, lines 29-36).

Claim 1 further recites "the processor further comprising: a first display module for displaying the wide angle image, and a second display module for displaying a perspective corrected view of a portion of the image". Zimmerman discloses a "display

driver" among other components that "function as a system to select a portion of the input image (fisheye or wide angle) and then mathematically transform the image to provide the proper prospective for output" (col. 4, lines 6-16). Zimmerman's invention goes on to display the output on "a video display device" (col. 3, lines 45-49). Zimmerman does not disclose two separate display modules to display the wide angle image and a perspective corrected view of a portion of the image. Manelphe, however, discloses a "first display means to display a wide-field image" (col. 2, lines 9-20) and "second display means to display the small-field image" (col. 2, lines 9-20). These displays are also disclosed as elements 16 and 17 in Figure 2. Manelphe discloses that the wide-field image "can provide only limited assistance for the navigation and attack functions" (col. 1, lines 24-33), thereby describing the motivation for adding the small-field image. It would have been obvious to one skilled in the art to modify Zimmerman to include two displays in order to view both wide-angle and small-angle images as taught by Manelphe.

Claim 1 further recites "the processor further comprising a correlation module for displaying a graphical object on the displayed wide angle image that identifies the selected portion of the image displayed in the perspective corrected view". Zimmerman does not disclose a correlation module that identifies the selected portion of the image displayed in the perspective corrected view. Manelphe, however, discloses "image processing means comprising means to provide a signal representing a small-field image, which is a portion of the wide-field image, with an adjustable enlargement and an adjustable position within the wide-field image" (col. 2, lines 12-17). Manelphe then

discloses a graphical object to select a portion of the image in the form of "a movable recticle 19, the position of which can be adjusted by means of the manual control device" (col. 3, lines 15-29). Also see Figure 2, elements 16-20 of Manelphe for further disclosure of the graphical object. This graphical object correlates the two images by identifying the selected portion of the wide-angle image displayed in the small-field image. It would have been obvious to one skilled in the art to modify Zimmerman to include a graphical object for identification in order to correlate wide-angle and small-angle images as taught by Manelphe.

12. Claim 2 recites "The device of claim 1, wherein the processor further comprising a scale adjuster that generates a perspective corrected view of the portion of the image at a user-adjustable magnification." Zimmerman discloses that "The invention also supports modifications in the magnification used to display the output image" (col. 4, lines 55-64). The output image in this case is the perspective corrected view. Zimmerman also discloses "input means for selecting said viewing angles and magnification" (col. 8, lines 34-35).

13. Claim 3 recites "The device of claim 1, further comprising a user interface module coupled to the processor for selecting a portion of the image to be displayed as a perspective corrected view." Zimmerman discloses "Remote control 12 and computer control 13 are accomplished via readily available switches and/or computer systems...These components function as a system to select a portion of the input image (fisheye or wide angle) and then mathematically transform the image to provide the

proper prospective for output" (col. 4, lines 6-16). The components disclosed constitute a user interface for selection of a portion of an image.

14. Claim 4 recites "The device of claim 3, wherein the user interface allows selecting a magnification for viewing the perspective-corrected portion of the image." Zimmerman discloses that "The invention also supports modifications in the magnification used to display the output image" (col. 4, lines 55-64). The output image in this case is the perspective corrected portion. Zimmerman also discloses "input means for selecting said viewing angles and magnification" (col. 8, lines 34-35). These input means constitute a user interface.

15. Claim 5 recites "The device of claim 1, wherein the wide angle image is a fish-eye image." Referring to Figure 1, Zimmerman discloses that "The fisheye lens 1 is exemplified by any series of wide angle lenses" (col. 3, lines 58-64). Zimmerman later discloses that the image can be "fisheye or wide angle" (col. 4, lines 6-16).

16. Claim 6 recites "The device of claim 2, wherein the processor generates the perspective corrected view of a portion of the image by transforming that portion according to the defined magnification and an angle for viewing a section of the hemisphere corresponding to that image portion from a point offset from the center of the hemisphere by a defined distance." Zimmerman discloses "image transform processor means... for producing output transform calculation signals according to a combination of said digitized signals, said selected viewing angles and said selected magnification" (col. 8, lines 24-31).

17. Claim 7 recites "The device of claim 5, wherein the image-capturing device further comprises an imager coupled to the fish-eye lens for converting optical photons collected by the lens from the field of view into electrical signals representing an image of the field of view." Zimmerman discloses that "The fisheye lens is attached to a camera 2 which converts the optical image into an electrical signal" (col. 1, lines 29-36).

18. Claim 8 recites "The device of claim 6, wherein the imager can be any of a CCD array, a CMOS array, or a thermal imaging device." Zimmerman discloses that "Any video source 2 and image capturing device 3 that converts the optical image into electronic memory can serve as the input for the invention" (col. 3, lines 58-64). CCD arrays, CMOS arrays, and thermal imaging devices all convert optical images into electronic memory and therefore are usable by Zimmerman's invention.

19. Claim 9 recites "The device of claim 7, wherein the imager has a resolution in a range of about one million to about 100 million effective pixels per square inch." Zimmerman discloses that "Any video source 2 and image capturing device 3 that converts the optical image into electronic memory can serve as the input for the invention" (col. 3, lines 58-64). "Any image capturing device" includes imagers in the resolution range of 1 million to 100 million effective pixels per square inch.

20. Claim 10 recites "The device of claim 5, wherein the processor generates the perspective-corrected view by mapping a point (u,v) on an undistorted image plane corresponding to a perspective-corrected portion of a distorted image to a point (x,y) on a plane corresponding to the distorted image, the mapping is provided by the following equations: x=R(.beta..sub.0/(PI/2))cos(d.sub.0), y=R(.beta..sub.0/(PI/2))sin(d.sub.0),

t=[Dd+sqrt(D.sup.2d.sup.2-(u.sup.2+v.sup.2+d.sup.2)(D.sup.2-1))]/(u.sup.2-+v.sup.2+d.sup.2), .beta..sub.0=arctan(-D cos(.beta.)+dt cos(.beta.)-vt sin(.beta.), 1) .delta..sub.0=arctan(-D sin(.beta.)+dt sin(.beta.)+vt cos(.beta.), ut)+.delta.where .beta. and .delta. are the zenith and azimuthal angles corresponding to the center of the undistorted image, .beta..sub.0 and .delta..sub.0 are the zenith and azimuthal angles corresponding to a pixel (u,v) in the undistorted image, d is a magnification factor, D is a level of undistortion, and R is the radius of the fisheye image."

Zimmerman discloses equations derived from the same equations that the equations in claim 10 are derived from. These original equations are shown by equations 2, 3, and 4 in col. 5 and col. 6 of Zimmerman. Zimmerman's derived equations are shown as equations 17 and 18 in col. 7. Explanation of these equations follows in lines 20-63 of col. 7: "The equations 17 and 18 provide a direct mapping from the UV space to the XY image space and are the fundamental mathematical result that supports the functioning of the present omnidirectional viewing system with no moving parts." Zimmerman does not disclose expressly the equations in claim 10.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to manipulate the equations disclosed by Zimmerman to derive the equations in claim 10. Applicant has not disclosed that the equations in claim 10 provide an advantage, are used for a particular purpose, or solve a stated problem. One of ordinary skill in the art would have expected Applicant's invention to perform equally well using equations 17-18 of Zimmerman because these equations serve the same purpose as the equations in claim 10 and contain the same variables as the

equations in claim 10. Therefore, it would have been obvious to one of ordinary skill in this art to modify Zimmerman to obtain the invention as specified in claim 10.

21. Claim 11 recites "The device of claim 10, wherein each of the distorted and undistorted image planes includes a two-dimensional array of pixels providing a digital luminance map corresponding to the image or a perspective-corrected portion of the image, respectively." Zimmerman does not disclose a digital luminance map corresponding to an image. Manelphe, however, discloses that "An image processing operation, performed by the processor 15, extracts a portion of the wide-field image, centered on the coordinates (x, y) and computes the luminance values of the small-field image. A standard method of performing this computation is, for example, by cubic interpolation" (col. 3, lines 42-52). Since Manelphe is computing values of the small-field image by cubic interpolation of the luminance values of the wide-field image, it is implied that the luminance values of the wide-field image are known. Therefore, Manelphe is disclosing a digital luminance map corresponding to the wide field image, as well one corresponding to the small-field image. It would have been obvious to one skilled in the art to modify Zimmerman to include a digital luminance map in order to display a small-field image from a wide-field image as taught by Manelphe.

22. Claim 12 recites "The device of claim 11, wherein the processor generates the luminance value of a pixel corresponding to the point (u,v) by calculating a weighted average of luminance values of two or more pixels surrounding the point (x,y), if the point (x,y) does not correspond to a pixel on the distorted image plane." Zimmerman does not disclose calculating a luminance value of a point on an image. Manelphe,

however, discloses that "An image processing operation, performed by the processor 15, extracts a portion of the wide-field image, centered on the coordinates (x, y) and computes the luminance values of the small-field image. A standard method of performing this computation is, for example, by cubic interpolation" (col. 3, lines 42-52). Cubic interpolation, as understood in the art, means calculating a center value based on the 8 surrounding values. This interpolation is a weighted average of luminance values of two or more pixels surrounding the point, as in claim 12. It would have been obvious to one skilled in the art to modify Zimmerman to calculate weighted luminance values based on wide-field luminance values in order to generate small-field image luminance values as taught by Manelphe.

23. Claim 13 recites "A device for providing a perspective corrected view of at least a portion of a wide angle image, comprising: an image-capturing device having a fish-eye lens for generating the wide angle image". Zimmerman discloses an invention that includes an "image capturing device" (col. 3, lines 60-64) with a "fisheye lens that provides an image of the environment with a 180 degree view" (col. 3, lines 29-36).

Claim 13 further recites "a processor coupled to the image capturing device that receives the image". Zimmerman discloses "An image processing system consisting of an X-MAP and Y-MAP processor" (col. 3, lines 29-36).

Claim 13 further recites "the processor displaying the image and a graphical object associated with the image for selecting a portion thereof, wherein the processor responds to the selection of a portion of the image by generating a perspective corrected view of that portion and displaying the perspective corrected view."

Zimmerman discloses a "display driver" among other components that "function as a system to select a portion of the input image (fisheye or wide angle) and then mathematically transform the image to provide the proper prospective for output" (col. 4, lines 6-16).

Zimmerman does not disclose a graphical object associated with the image for selecting a portion thereof, nor does Zimmerman disclose a processor response to the selection of a portion of an image. Manelphe, however, discloses a "first display means to display a wide-field image" (col. 2, lines 9-20) and "second display means to display the small-field image" (col. 2, lines 9-20). Manelphe further discloses a graphical object to select a portion of the image in the form of "a movable recticle 19, the position of which can be adjusted by means of the manual control device" (col. 3, lines 15-29). It is further shown that Manelphe uses a processor to respond to graphical object selection: "The manual control device 14 has an output connected to an input of the image processor 15, to give it coordinates (x, y) defining the position of the movable recticle 19 within the wide-field image" (col. 3, lines 37-41). Also see Figure 2, elements 16-20 for further disclosure of the graphical object. Manelphe's reason for inventing the system including the graphical object for object selection is to be able to zoom in on an object from a wide view without a special lens: "The system is simpler... since it has no zoom lens or aiming device" (col. 1, lines 61-68; col. 2, line 1). It would have been obvious to one skilled in the art to modify Zimmerman to include a graphical object for object selection in order to zoom in on a specified area without using a zoom lens or other special equipment as taught by Manelphe.

24. Claim 14 recites "The device of claim 13, further comprising a user interface module coupled to the graphical object and the processor for effecting the selection of a portion of the image by associating the graphical object with that portion." Manelphe discloses "a movable recticle 19, the position of which can be adjusted by means of the manual control device" (col. 3, lines 15-29). It is further shown that Manelphe uses a processor to respond to graphical object selection: "The manual control device 14 has an output connected to an input of the image processor 15, to give it coordinates (x, y) defining the position of the movable recticle 19 within the wide-field image" (col. 3, lines 37-41).

25. Claim 15 recites "The device of claim 14, wherein the user interface module permits selecting a magnification for viewing the portion of the image selected by the graphical object." Manelphe discloses "image processing means comprising means to provide a signal representing a small-field image, which is a portion of the wide-field image, with an adjustable enlargement and an adjustable position within the wide-field image" (col. 2, lines 9-20).

26. Claim 16 recites "The device of claim 15, wherein the processor corrects the selected portion of the image for perspective distortions in accord with the selected magnification and an angle for viewing a portion of a hemispherical field of view corresponding to the selected image portion from a vantage point offset from a center of the hemisphere." Zimmerman discloses "image transform processor means... for producing output transform calculation signals according to a combination of said

digitized signals, said selected viewing angles and said selected magnification" (col. 8, lines 24-31).

27. Claim 23 recites "A device for imaging a field of view, comprising an image-capturing device having a fish-eye lens for acquiring a fish-eye image of the field of view". Zimmerman discloses an invention that includes an "image capturing device" (col. 3, lines 60-64) with a "fisheye lens that provides an image of the environment with a 180 degree view" (col. 3, lines 29-36).

Claim 23 further recites "a processor in communication with the image-capturing device". Zimmerman discloses "An image processing system consisting of an X-MAP and Y-MAP processor" (col. 3, lines 29-36).

Claim 23 further recites "a display coupled to the processor for presenting the fish-eye image and a perspective-corrected view of a portion thereof". Zimmerman discloses a "display driver" among other components that "function as a system to select a portion of the input image (fisheye or wide angle) and then mathematically transform the image to provide the proper prospective for output" (col. 4, lines 6-16). Zimmerman's invention goes on to display the output on "a video display device" (col. 3, lines 45-49).

Claim 23 further recites "a graphical object presented on the display in association with a portion of the fish-eye image, the processor effecting the presentation of the fish-eye image on the display, and further generating a perspective-corrected view of the portion of the fish-eye image associated with the graphical object, and

effecting the display of the perspective-corrected view in an area of the display circumscribed by the graphical object."

Zimmerman does not disclose a graphical object in association with a portion of the fisheye image, nor does Zimmerman disclose a perspective-corrected view of that portion. Manelphe, however, discloses a graphical object to select a portion of the image in the form of "a movable recticle 19, the position of which can be adjusted by means of the manual control device" (col. 3, lines 15-29). It is further shown that Manelphe uses a processor to respond to graphical object selection: "The manual control device 14 has an output connected to an input of the image processor 15, to give it coordinates (x, y) defining the position of the movable recticle 19 within the wide-field image" (col. 3, lines 37-41). Also see Figure 2, elements 16-20 for further disclosure of the graphical object. Manelphe's reason for inventing the system including the graphical object for object selection is to be able to zoom in on an object from a wide view without a special lens: "The system is simpler... since it has no zoom lens or aiming device" (col. 1, lines 61-68; col. 2, line 1). It would have been obvious to one skilled in the art to modify Zimmerman to include a graphical object for object selection in order to zoom in on a specified area without using a zoom lens or other special equipment as taught by Manelphe.

28. Claims 18 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmerman.

29. Claim 18 recites "The device of claim 17, wherein the processor employs the following equations to effect the mapping between the point (u,v) and the point (x,y):

x=R(.beta..sub.0/(PI/2))cos(d.sub.0), y=R(.beta..sub.0/(PI/2))sin(d- .sub.0), t=[Dd+sqrt(D.sup.2d.sup.2-(u.sup.2+v.sup.2+d.sup.2)(D.sup.2-1))]/(-u.sup.2+v.sup.2+d.sup.2), .beta..sub.0=arctan(-D cos(.beta.)+dt cos(.beta.)-vt sin(.beta.), 1), .delta..sub.0=arctan(-D sin(.beta.)+dt sin(.beta.)+vt cos(.beta.), ut)+.delta.where .beta. and .delta. are the zenith and azimuthal angles corresponding to the center of the undistorted image, .beta..sub.0 and .delta..sub.0 are the zenith and azimuthal angles corresponding to a pixel (u,v) in the undistorted image, d is the magnification factor, D is the level of undistortion, and R is the radius of the fisheye image"

Zimmerman discloses equations derived from the same equations that the equations in claim 18 are derived from. These original equations are shown by equations 2, 3, and 4 in col. 5 and col. 6 of Zimmerman. Zimmerman's derived equations are shown as equations 17 and 18 in col. 7. Explanation of these equations follows in lines 20-63 of col. 7: "The equations 17 and 18 provide a direct mapping from the UV space to the XY image space and are the fundamental mathematical result that supports the functioning of the present omnidirectional viewing system with no moving parts." Zimmerman does not disclose expressly the equations in claim 18.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to manipulate the equations disclosed by Zimmerman to derive the equations in claim 18. Applicant has not disclosed that the equations in claim 18 provide an advantage, are used for a particular purpose, or solve a stated problem. One of ordinary skill in the art would have expected Applicant's invention to perform

equally well using equations 17-18 of Zimmerman because these equations serve the same purpose as the equations in claim 18 and contain the same variables as the equations in claim 18. Therefore, it would have been obvious to one of ordinary skill in this art to modify Zimmerman to obtain the invention as specified in claim 18.

30. Claim 24 recites "A method for generating a perspective-corrected view of a portion of a fish-eye image, comprising: mapping a point (u,v) on an undistorted image plane corresponding to a perspective view of the image portion to a point (x,y) on a distorted image plane corresponding to the fish-eye image according to the following equations: x=R(.beta..sub.0/(PI/2))cos(d.sub.0-), y=R(.beta..sub.0/(PI/2))sin(d.sub.0) t=[Dd+sqrt(D.sup.2d.sup.2-(u.sup.2+-v.sup.2+d.sup.2)(D.sup.2-1))]/(u.sup.2+v.sup.2+d.sup.2) .beta..sub.0=arctan(-D cos(.beta.)+dt cos(.beta.)-vt sin(.beta.), 1) .delta..sub.0=arctan(-D sin(.beta.)+dt sin(.beta.)+vt cos(.beta.), ut)+.delta.where .beta. and .delta. are the zenith and azimuthal angles corresponding to the center of the undistorted image, .beta..sub.0 and .delta..sub.0 are the zenith and azimuthal angles corresponding to a pixel (u,v) in the undistorted image, d is the magnification factor, D is the level of undistortion, and R is the radius of the fisheye image."

Equations 17 and 18 in col. 7 of Zimmerman show a method of correcting a portion of a fish-eye image by mapping an object point (u,v) that represents where the image is actually located to an image point (x,y). These equations disclosed by Zimmerman are derived from the same equations that the equations in claim 24 are derived from. These original equations are shown by equations 2, 3, and 4 in col. 5 and

col. 6 of Zimmerman. Explanation of Zimmerman's equations follows in lines 20-63 of col. 7: "The equations 17 and 18 provide a direct mapping from the UV space to the XY image space and are the fundamental mathematical result that supports the functioning of the present omnidirectional viewing system with no moving parts." Zimmerman does not disclose expressly the equations in claim 24.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to manipulate the equations disclosed by Zimmerman to derive the equations in claim 24. Applicant has not disclosed that the equations in claim 24 provide an advantage, are used for a particular purpose, or solve a stated problem. One of ordinary skill in the art would have expected Applicant's invention to perform equally well using equations 17-18 of Zimmerman because these equations serve the same purpose as the equations in claim 24 and contain the same variables as the equations in claim 24. Therefore, it would have been obvious to one of ordinary skill in this art to modify Zimmerman to obtain the invention as specified in claim 24.

31. Claims 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmerman in view of Richardson (U.S. Patent 5,489,940).

32. Claim 19 recites "A device for imaging a field of view, comprising: an image-capturing device having a fish-eye lens for generating a wide angle image of the field of view". Zimmerman discloses an invention that includes an "image capturing device" (col. 3, lines 60-64) with a "fisheye lens that provides an image of the environment with a 180 degree view" (col. 3, lines 29-36).

Claim 19 further recites "a processor coupled to the image-capturing device to receive the image". Zimmerman discloses "An image processing system consisting of an X-MAP and Y-MAP processor" (col. 3, lines 29-36).

Claim 19 further recites "the processor displaying the wide-angle image and further selecting a portion of the image based on a pre-programmed set of rules, the processor generating a perspective corrected view of the selected portion and displaying the perspective-corrected view." Zimmerman discloses a "display driver" among other components that "function as a system to select a portion of the input image (fisheye or wide angle) and then mathematically transform the image to provide the proper prospective for output" (col. 4, lines 6-16). Zimmerman's invention goes on to display the output on "a video display device" (col. 3, lines 45-49). Zimmerman does not disclose selecting a portion of an image based on a pre-programmed set of rules.

Richardson, however, discloses a method of inputting and correcting a panoramic image that includes an "image processing unit 74 [that] includes image recognition and tracking capabilities. A particular image could be recognized and its region in the image automatically selected" (col. 4, lines 40-45). Tracking and recognizing an image is based on certain rules about what an image is allowed and not allowed to contain. Richardson's method automatically selects certain regions for display based on these rules. It would have been obvious to one skilled in the art to modify Zimmerman to select certain images based on rules in order to select an image for display without a user input and add image tracking abilities as taught by Richardson.

33. Claim 20 recites "The device of claim 19, further comprising a buffer for storing the set of rules." Richardson discloses an "image processing unit 74 [that] includes image recognition and tracking capabilities" (col. 4, lines 40-45). It is implied that an image processing unit that included these capabilities would need to use a buffer or other memory to store rules for tracking these images.

34. Claims 21-22, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmerman in view of Richardson as applied to claim 20 above, and further in view of Manelphe.

35. Claim 21 recites "The device of claim 20, wherein the processor identifies the selected portion on the image presented on the first display." Zimmerman in view of Richardson obviates the device of claim 20. Neither Zimmerman nor Richardson discloses identification of the selected portion on the image on the display. Manelphe, however, discloses a graphical object for identification in the form of "a movable recticle 19" (col. 3, lines 15-29). Also see Figure 2, elements 16-20 of Manelphe for further disclosure of the graphical object. This graphical object correlates the two images by identifying the selected portion of the wide-angle image displayed in the small-field image. It would have been obvious to one skilled in the art to modify Zimmerman to include a graphical object for identification in order to correlate the small-field image to the wide-field image as taught by Manelphe.

36. Claim 22 recites "The device of claim 21, wherein the processor displays a graphical object on the displayed wide-angle image to identify a portion of the image corresponding to the perspective-corrected view." Manelphe discloses a graphical

object for identification in the form of "a movable recticle 19" (col. 3, lines 15-29). Also see Figure 2, elements 16-20 of Manelphe for further disclosure of the graphical object. This graphical object correlates the two images by identifying the selected portion of the wide-angle image displayed in the small-field image.

Conclusion

37. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patent is cited to further show the state of the art with respect to perspective correction in panoramic images in general:

U.S. Patent 6,377,294 to Toyofuko

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron M Richer whose telephone number is (703) 305-5825. The examiner can normally be reached on weekdays from 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso, can be reached on (703)-305-3885. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-5397.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

AMR
11/12/03

JOSEPH MANCUSO
PRIMARY EXAMINER